Reg. No.



## MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

## **VI SEMESTER B.TECH (OPEN ELECTIVE -II) END SEMESTER EXAMINATION, MAY. 2019**

SUBJECT: INTRODUCTION TO OPERATIONS RESEARCH (MME 3288) **REVISED CREDIT SYSTEM** 

Ti	me: 3 Hours MAX. MARKS:	50
	Instructions to Candidates:	
	✤ Answer ALL the questions.	
	<ul> <li>Missing data if any may be suitable assumed.</li> </ul>	
1A.	What are the assumptions made in a linear programming problem? Explain.	(05)
1B.	Why floats are used in the project network? Which are the different types of floats used in the analysis of a project network? Explain.	(05)

- 2A. What are the unique characteristics of an assignment matrix? (02)
- **2B.** Solve the following game.

		Comp	any 'B'	Strateg	у	
		$B_1$	$B_2$	B <sub>3</sub>	$B_4$	
	$A_1$	2	6	-3	2	(05)
Company 'A'	$A_2$	-2	1	2	-3	(00)
Strategy	$A_3$	4	12	0	7	
	$A_4$	3	1	6	1	

- 2C. What is Monte Carlo Simulation? List the advantages, limitations and (03) applications of Monte Carlo Simulation.
- **3A.** Following are the various activities involved in a project. The cost and time for these activities is given below.

Activity	(i, j)	Predecessor	Time es (day	timates /s)	Direc estim (Rs	ct cost ates × 1000)	(0
			Normal	Crash	Normal	Crash	_
А	(1,2)	-	15	10	100	300	
В	(1,3)	А	8	6	120	200	
С	(2,4)	A	16	8	90	120	

)5)

D	(2,5)	В	5	4	70	140
E	(3,5)	С	4	2	160	300
F	(3,6)	В	10	7	70	140
G	(4,6)	С	6	4	400	600
Н	(5,6)	D, E	14	9	600	900

Indirect cost is Rs. 200/day.

a) Draw the CPM network

b) Find out the critical path and project completion time.

c) What is the minimum possible project completion time after crashing the activities involved in the project and the associated cost of completing the project?

**3B.** Obtain the dual of the LPP given below.

- Min  $Z = 10X_1 8X_2 + 12X_3$ Subject to the constraints:  $X_1 - X_2 + 3X_3$ = 10 ≥ 16 ≤ 11  $2X_1 + X_2 - 3X_3$  $3X_1 + X_2 + 2X_3$  $X_1, X_3 \ge 0;$   $X_2$  unrestricted
- **4A.** Solve the given LPP using Simplex method Maximise  $Z = 12X_1 + 8X_2 + 5X_3$ Subject to the constraints  $X_1 + 3X_2 + X_3 \le 270$  $2X_1 + X_2 + X_3 \le 225$  $2X_1 + 3X_2 + 5X_3 \le 250$  $X_1, X_2, X_3 \ge 0$
- **4B.** Ranbir has to visit five cities A, B, C, D and E starting with city A where he is stationed. The distance between various cities is given in the table. Ranbir wants to develop a tour through the four other cities and return to his home city in such a way that he has to travel minimum distance. Solve.

		To city						
		А	В	С	D	Е		
	Α		12	8	4	6		
Erom	В	12		6	3	4		
city	С	8	6		2	7		
	D	4	3	2		3		
	Е	5	4	7	3			

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(05)

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Iransportation lable								
To → From	D	E	F	Supply				
A	6	4 4	1 1	50				
В	20 5	20 8	7	40				
С	4	60 5	3	60				
Demand	20	95	35	150				

## . .. ....

(05)

Conduct following sensitivity analysis on the optimal table.

a) Suppose if it is possible to stock less at 'B' and more at 'C' for same overall total, would there be any advantage of this change?

b) Suppose 'F' wants one more unit and 'B' has an extra unit available, what is

the extra cost of meeting the demand?

c) What would happen if 'D' wanted one more unit and 'C' had it?

5B. Conduct the sensitivity analysis for changes in the objective function coefficients and r Rigand right hand side values of constraints for the given LPP.

Maximize  $Z = 15X_1 + 24X_2$ 

Subject to constraints,  $2X_1 + X_2 \le 58$  $X_1 + 3X_2 \le 80$  $3X_1 + X_2 \le 100$ 

 $X_1, X_2 \ge 0;$ 

Optimal table obtained by the simplex algorithm for maximization LPP is (03) given below.

Basi	X <sub>1</sub>	X <sub>2</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	b <sub>i</sub>	
X <sub>1</sub>	15	0	1	0.60	-0.20	0	18.80
X <sub>2</sub>	24	1	0	-0.20	0.40	0	20.4
S <sub>3</sub>	0	0	0	-1.60	0.20	1	23.20
Ci		15	24	0	0	0	
Solution		18.8	20.4	0	23.20	0	
$\Delta_{i}$		0	0	-4.2	-6.60	0	

**5C.** Sketch the flow chart of a transportation model.

(02)